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ON THE FOSSÆ ROUND THE CÆCUM, AND THE POSITION OF THE VERMIFORM APPENDIX, WITH SPECIAL REFERENCE TO RETRO-PERITONEAL HERNIA. By C. B. LOCKWOOD, F.R.C.S., and H. D. ROLLESTON, M.B.

(Communicated to the Anatomical Society of Great Britain and Ireland.)

SOME time ago our attention was attracted to the occasional concealment of the vermiform appendix within the pouches which surround the cæcum.¹ The search for more examples of this variety of retro-peritoneal hernia has been continued, and the results are given in this communication. The success which has attended our efforts has been considerable, and we are now able to refer to more than twenty-three fresh examples. Further, we have taken the opportunity of ascertaining and noting the other, and more usual, positions which the vermiform appendix may occupy. The last branch of our subject has received a great deal of attention, and does not require so much discussion. But retro-peritoneal hernia of the vermiform appendix has been singularly overlooked, and we propose to refer in detail to the fresh examples which we have found.

The whole subject of retro-peritoneal hernia of the vermiform appendix is inextricably connected with that of the anatomy of the various peritoneal fossæ around the cæcum. Therefore it will be necessary, as we proceed, to give an account of these pouches.

The more recent writings² show that there is great difference of opinion as to their anatomy. We have met with two of first rate importance, viz., the *ileo-cæcal* fossa, which is situated at the angle between the ileum and cæcum, and the *subcæcal*, the mouth of which is underneath the cæcum, and which runs

¹ *Hunterian Lectures on Hernia*, by C. B. Lockwood, Lond. 1889, p. 83 *et seq.* Also "Retro-peritoneal Hernia of the Vermiform Appendix," by the same author, *Trans. Path. Soc. Lond.*, vol. xli., 1890, p. 118.

² *Jonnesco, Hernies Internes Rétro-Peritonéales*, Paris, 1890, p. 104 *et seq.*

upwards beneath the right colon. These fossæ, which will be described presently, are almost constant. Their existence is quite independent of the presence or absence of an appendix, or of its mesentery. And, here, it may be said, that we do not believe that the vermiform appendix is ever absent, except as the result of disease. The instances in which absence has been assumed¹ are capable of another explanation. As will be seen later, the appendix is often hidden away in either the ileo-cæcal or subcæcal pouch. Further, the entrances of either of these pouches may be occluded, so that nothing but a careful dissection would reveal the presence of either the pouch or of its contents.

Observers have always determined the presence of these pouches by looking for the entrance into them, but it is evident that the fact that the entrance may not exist throws great doubt upon any observations founded upon that method.

In connection with this question it is interesting to note that Schott² has given two instances of cysts near the ileo-cæcal junction, which he attributes to closure of the mouths of the ileo-cæcal fossæ. One of these cysts was found by Widerhofer in a child of 18 months; it was as large as a walnut, and contained colloid contents. The other was found in an adult, and was as large as an apple, tense, with thin walls, and clean serous contents. It might also be found that cysts occurred in the situations of the other peritoneal pouches, viz., of the intersigmoid and jejuno-duodenal.

That retro-peritoneal hernia of the vermiform appendix has been almost entirely overlooked and its importance ignored, is shown by a reference to the writings of others. Mr Treves, who examined the cæcal region in one hundred bodies, does not mention it.³ Jonnesco, the latest writer⁴ upon the subject, merely refers to Tuffier's⁵ casual remark that he had found fossæ behind the cæcum which often lodged in the vermiform appendix. Our best text-books are silent upon the

¹ "On the Surgical Anatomy of the Vermiform Appendix," by John Ferguson, *Amer. Jour. Med. Sci.*, vol. ci., p. 61.

² *Beiträge zur Anatomie der Fossa Ilio-Cæcalis. Wochenblatt der Zeitschrift der K. K. Gesellschaft der Aerzte in Wien*, 1862, pp. 345-347.

³ *Hunterian Lectures on the Anatomy of the Intestinal Canal and Peritoneum in Man*, by Frederick Treves, Lond. 1885, p. 46 *et seq.*

⁴ *Loc. cit.*, p. 115.

⁵ "Étude sur le Cæcum," *Archives Générales de Médecine*, 1887, p. 652.

question, and also¹ the writings of Luschka, Langer,² or Bardeleben.³ Nor does Ferguson allude to it although he made a special examination of the vermiform appendix in two hundred bodies.⁴ However, he remarks that it was in seventy-seven instances so situated behind the cæcum that a perforation of it would have opened into the subperitoneal cellular tissue, and this exemplifies the importance of our subject. As we proceed, it will be seen that the recognition of this variety of retro-peritoneal hernia affords a ready explanation of the course which the pus has been known to take in cases of perforation of the appendix, especially those in which it travels upwards behind the right colon to the right kidney, and onwards, perhaps, as far as the diaphragm and right lung and pleura.⁵ Further, as our statistics show, the appendix is so often concealed in retro-peritoneal fossæ, that surgeons ought certainly to be familiar with the fact. We have heard of more than one instance in which operators have failed to discover the appendix, and have therefore closed the abdomen after coming to the conclusion that it was absent.

In concluding this brief reference to the literature, we note that Mr L. A. Dunn⁶ showed a specimen at the Pathological Society of London in which the vermiform appendix lay in a fossa behind the cæcum, and Dr Mott⁷ one in which it lay in the fossa iliaca subfascialis. Both of these references are exceedingly brief.

Ileo-colic Fossa.—By this name we wish to designate a peritoneal fossa, which is found at the junction of the ileum and colon (figs. 1 and 3). As those intestines lie in their natural position, they form an angle which has the ascending colon for its outer boundary and the ileum for its lower, and the mesentery for its floor. Very often a fold of peritoneum roofs in this angle, and it thus becomes a fossa, the mouth of which looks upwards

¹ "Ueber die Peritoneale umhüllung des Blinddarmes und ueber die Fossa Ilio-Cæcalis," Luschka, *Virchow's Archiv für Path. Anatomie*, vol. xxi. pp. 285–288.

² *Die Peritoneal Taschen am Cæcum.* *Wochenblatt der Zeitschrift der K.K. Gesellschaft der Aerzte*, Langer, 1862, pp. 129–131.

³ "Ueber die Lage des Blinddarmes beim Menschen," *Virchow's Archiv für Path. Anatomie*, vol. ii., 1849, p. 283.

⁴ "The Surgical Anatomy of the Vermiform Appendix," *The Amer. Jour. Med. Sci.*, vol. ci., No. 1, p. 61.

⁵ See A. Fraenkel, "Ueber die Folgen des Perforation des Processus Vermiformis und deren Behandlung," *Deutsche Med. Wochenschrift*, Jan. 22, 1891, p. 137 *et seq.* Also Treves, *Brit. Med. Jour.*, Nov. 9, 1889, p. 1030.

⁶ "Retro-cæcal Hernia of the Appendix Cæci," *Trans. Path. Soc.*, vol. xl., 1889, p. 114.

⁷ "Two Anomalous Vermiform Appendices," *Trans. Path. Soc.*, vol. xl., 1889, p. 105.

and towards the left, whilst its apex is at the junction of the ileum and cæcum (*vide* figs. 1 and 3).

The floor of the ileo-colic fossa is formed by the mesentery, and sometimes by a portion of the ileum. The fold of peritoneum

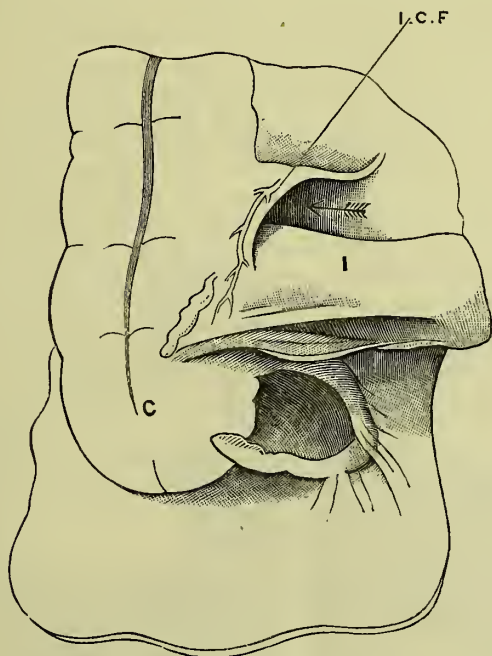


FIG. 1.—The Ileo-colic Fossa; the arrow marks the fossa. C, cæcum; I, ileum; I.C.F., ileo-colic fold.

which roofs it in carries a branch (*arteria ileo-cæcalis anterior*) of the ileo-colic artery to the front part of the cæcum, crossing the ileum in its course. This fold has had various names given to it. Treves and Tuffier call it the superior ileo-cæcal fold; referring, perhaps, to its vascular contents. Jonnesco, keeping its beginning and end in view, names it the mesenterico-cæcal. Inasmuch as it seldom reaches the cæcum, and to avoid confusing it with another ileo-cæcal fold, which will be mentioned presently, we shall in future call it the ileo-colic fold after the fossa which lies beneath it. This ileo-colic fold varies, and it may be either absent, or run over the front of the ileum along the colon as far as the cæcum. Of course the ileo-colic

fossa varies in depth and extent according to the width of the fold. The ileo-colic fold is sometimes laden with fat; and at others fringed with appendices epiploicæ.

The fossa which we have termed the ileo-colic has been called by other names. Waldeyer, Hartmann, Treves, and Tuffier call it the superior ileo-cæcal fossa; Jonnesco merely calls it the ileo-cæcal.¹ However, the fossa has for its main boundaries the ileum and colon, and is quite independent of the cæcum. Therefore, we prefer to call it the ileo-colic fossa lest it be thought that it has anything to do with the cæcum. Doubtless confusion has arisen from an imperfect definition of the extent of the cæcum. As one of us has said elsewhere² "the cæcum is that part of the large intestine which is situated below the entrance of the ileum, and would, therefore, be marked off from the large intestine by a line drawn across the right colon at right angles to its axis, and in the same level as the lower margin of the ileum. This definition accords with the developmental history of the cæcum, because it originates as a diverticulum from the side of the rudimentary alimentary canal, and under normal circumstances this outgrowth is entirely covered with a layer of serous membrane, which it retains throughout the life of the individual."

We have not as yet met with any cases of hernia into the ileo-colic fossa, and we have also observed that the presence of this pouch is comparatively rare.

The Ileo-cæcal Fossa.—This fossa is situated behind the angle of junction of the ileum and cæcum, which have both to be lifted up to see its mouth (*vide* fig. 2). The fossa itself runs a varying distance upwards behind the ileo-colic junction and parallel to the ascending colon. It is bounded to the right by the mesentery of the ascending colon, and on the left by the mesentery. The fossa in the accompanying figure was almost 3 inches long, and would easily admit the finger or a loop of intestine. Sometimes the ileo-cæcal fossa reaches half way up the ascending colon beyond the crest of the ilium, and ends close to the kidney and duodenum. Thus, when the appendix suppurates whilst lying in such a fossa, the resulting abscess may be mistaken for one connected with the kidney. According to this description, which is founded upon the examination of many specimens, the ileo-cæcal fossa is in its typical state comparatively simple and quite independent of the vermiform

¹ *Loc. cit.*, p. 116 *et seq.*

² Lockwood, *Lectures on Hernia*, p. 139.

appendix or its mesentery, or of any other peritoneal folds, except the mesentery of the ascending colon and *the* mesentery.

Origin of the Ileo-cæcal Fossa.—The ileo-cæcal fossa is developed during the descent of the cæcum and end of the ileum into the iliac fossa. It is well known that the cæcum is at one time situated beneath the liver, and, together with the colon, is carried upon the same mesentery as the rest of the intestines. From its high position the cæcum, together with the end of the ileum, the mesentery, and vermiform appendix, descends into the

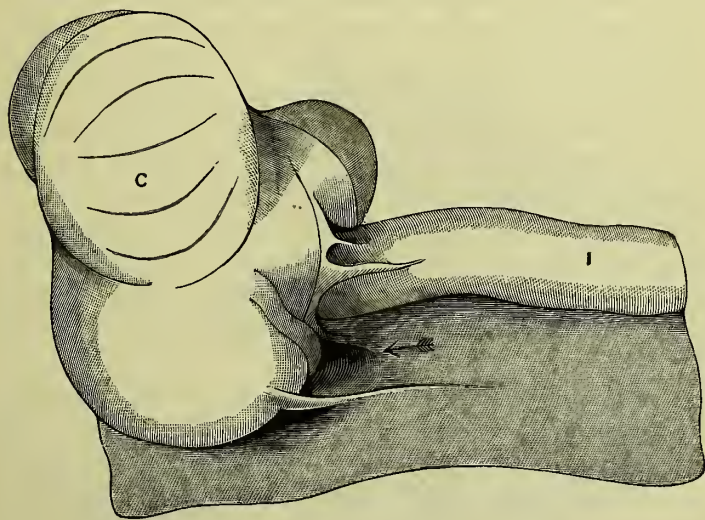


FIG. 2.—The Ileo-cæcal Fossa, to illustrate Retro-peritoneal Hernia of the Vermiform Appendix into the Ileo-cæcal Fossa; the arrow marks the fossa. I, ileum; C, cæcum.

iliac fossa; its progress being assisted by the gubernaculum. The gubernaculum does this by means of an accessory band of muscular fibres, which it sends upwards beyond the ovary or testis in the plica vascularis. The latter fold is the upper part of the mesorchium or mesovarium, and has been described by one of us¹ under the name of plica vascularis; because it contains the spermatic or ovarian vessels. The plica vascularis ends above upon either the vermiform appendix, the mesentery, the

¹ "The Morbid Anatomy and Pathology of Encysted and Infantile Hernia," by C. B. Lockwood, *Medico Chirurgical Trans.*, vol. lxi. p. 503.

cæcum, or ileum. As it assists in pulling those organs towards the iliac fossa, the peritoneum beneath the mesentery descends unequally, and the part near the ileo-cæcal junction remains behind. Hence, by the time the cæcum and right colon have assumed their permanent position, a recess has been created, which is the ileo-cæcal fossa. Another factor in the process is the substitution of the permanent ascending mesocolon for the original one, which, as we have already said, is part of the mesentery.

The reason for the incomplete descent of the peritoneum which forms the ileo-cæcal fossa is obscure. The explanation probably turns upon the action of the blood-vessels and suspensory muscle of the mesentery in restraining the movements of the peritoneum at the angle between the ileum and colon, this being the portion of serous membrane which, by its occasional incomplete descent, forms the ileo-cæcal fossa.

The anatomy of the ileo-cæcal fossa is seldom as simple as we have described. It is usually complicated by two folds of peritoneum, one of which is the mesentery of the vermiform appendix, the other a fold of doubtful origin, and usually called the plica ileo-cæcalis.

The Meso-appendix.—The mesentery of the vermiform appendix is fairly constant. It consists of two layers of peritoneum, between which the vessels, lymphatics, and nerves of the appendix run. Its usual characters are shown in the accompanying sketch (fig. 3). Above it has a base which often springs from the under layer of the mesentery; below, its layers are reflected round the appendix; towards the right, it ends at the ileo-cæcal angle; whilst, towards the left, it has a sharp, free edge which contains the appendicular vessels and some fat. When the cæcum, ileum, and appendix are disposed so as to display the meso-appendix, its plane is in many cases at right angles to that of the mesentery, and parallel to that of the iliac fossa.

The meso-appendix seldom reaches more than half or two-thirds of the way along the appendix, and usually gives the impression of being too short, so as to cause the appendix to coil upon itself.

The meso-appendix is variable, and we have observed the

following deviations from the above account. (1) It is sometimes absent, so that the vermiform appendix is quite free in the abdomen. (2) It may be longer than usual, and reach as far as the free end of the appendix. In one of our specimens it reached as far as the end of an appendix 4 inches long. (3) It may have become obliterated by its peritoneum having been spread out in the iliac fossa by the traction of the gubernaculum. The

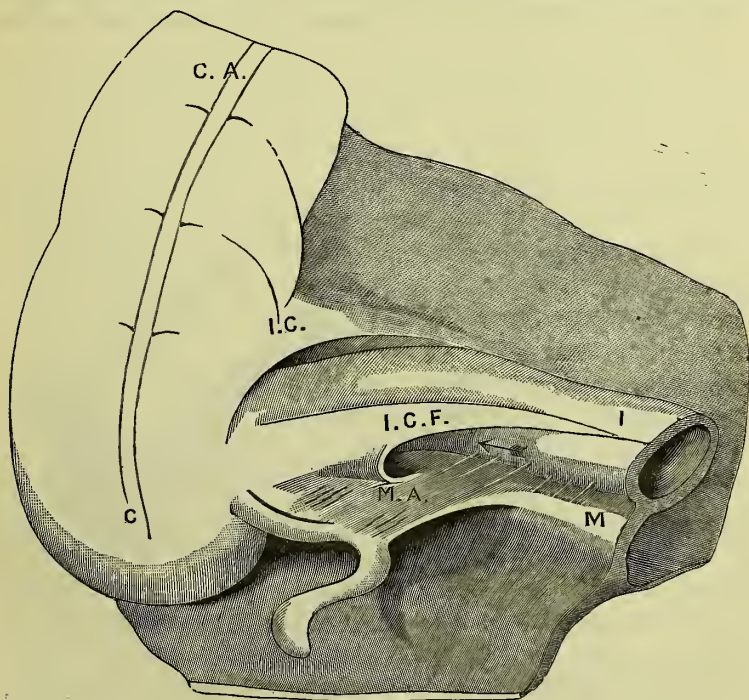


FIG. 3.—The Folds about the Cæcum. C, cæcum; C.A., ascending colon; I, ileum; I.C., ileo-colic fold; I.C.F., ileo-cæcal fold; M, mesentery; M.A., meso-appendix. The arrow marks the superior ileo-cæcal fossa.

accompanying sketch (fig. 1) shows this variation, and it may be noted that only the cæcal end of the appendix has become bound down in the iliac fossa, and that the other end, which seldom has any mesentery, remains free. (4) The meso-appendix may be hidden away and attached within the ileo-cæcal or sub-cæcal fossa. (5) It may have a hole in it through which the small intestine has been known to herniate and become strangu-

lated.¹ (6) Its attachments vary. Often it springs from the mesentery, but it may originate from the iliac fossa or cæcum, or from both, or from the back of the colon, as in one of our specimens in which the colon of a child was floating, not having assumed its mesocolon. We need scarcely repeat that it may be attached within the ileocæcal or subcæcal fossæ.

When the meso-appendix is present it may, as in two specimens which lie before us, partition the ileo-cæcal fossa so as

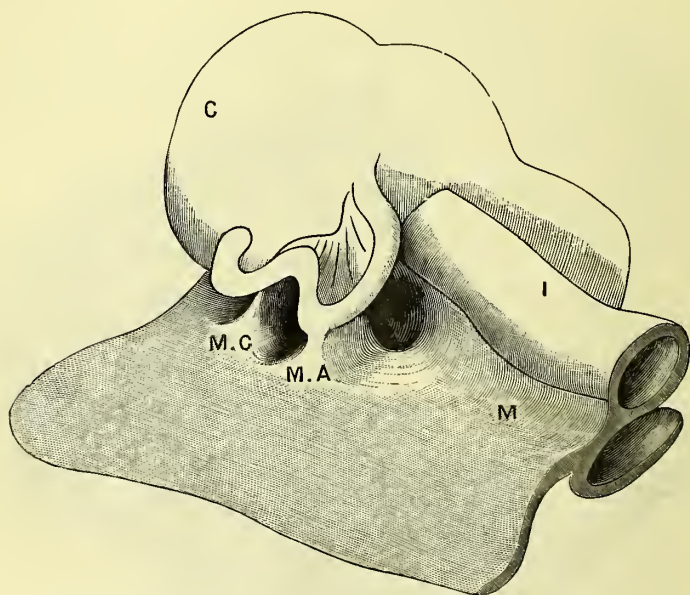


FIG. 4.—The Superior and Inferior Ileo-cæcal Fossæ. C, cæcum; I, ileum; M.A., meso-appendix; M.C., meso-cæcum; M, mesentery.

to make it into two compartments—one above and the other below the meso-appendix, and called therefore, in the rest of this communication, the superior and inferior ileo-cæcal fossæ (fig. 4). Both of these subsidiary fossæ are, however, merely accidental and dependent upon the presence and position of the meso-appendix.

In the specimen delineated in fig. 4, the meso-appendix, besides being attached to the floor of the ileo-cæcal fossa, runs a

¹ See a case by T. E. Little, *Dub. Jour. Med. Sci.*, 1871, vol. lii. p. 236.

little way upon the cæcum; but it is difficult in a drawing to show the continuity of the two parts of the fold.

The Ileo-cæcal Fold.—This fold is situated in the ileo-cæcal angle, and, although liable to considerable variation, is fairly constant. In specimens in which the folds are very well developed it lies in front of the meso-appendix (fig. 3), and consists of two layers of peritoneum, between which are some fat and muscular fibres, and arteries and veins derived from three sources, viz., from the anterior and posterior ileo-cæcal, and from the appendicular vessels; which latter are recurrent. None of these vessels are very large, but they were easily seen in the various specimens which we injected. Therefore, we cannot agree with Mr Treves¹ in calling the ileo-cæcal fold “the bloodless fold.” Most often, however, the ileo-cæcal fold is small and comparatively non-vascular, and merely lies in the ileo-cæcal angle (figs. 2 and 5). Two of its sides are fastened on either hand to the ileum and cæcum, and the other is free and forms the upper boundary of the mouth of the ileo-cæcal fossa.

But in those cases in which the ileo-cæcal fold does not agree with this account it is still more or less triangular, with its apex at the ileo-cæcal junction and its base free, but bounding the mouth of the *superior ileo-cæcal fossa*, instead of the mouth of the *ileo-cæcal fossa*; the latter having been subdivided by the meso-appendix (fig 3). Also, of its two sides the superior is attached to the ileum, the other to the cæcum and upper surface of the meso-appendix (fig. 3.); sometimes this attachment is to the appendix itself. When the ileo-cæcal fold has this arrangement its upper surface looks towards the general peritoneal cavity, whilst its lower surface forms the roof of the superior ileo-cæcal fossa.

In a specimen which lies before us the ileo-cæcal fold is attached to the meso-appendix so near the mesentery that the superior ileo-cæcal fossa is a long, narrow slit, lying upon the side of the ileum.

The ileo-cæcal fold is not infrequently absent, and sometimes its situation is occupied by two folds (fig. 1).

There is much difference of opinion as to the nomenclature, anatomy, and morphology of the ileo-cæcal fold, and of the superior

¹ *Loc. cit.*, p. 49.

ileo-cæcal fossa. We have already mentioned our objection to the name which Mr Treves has given to the fold, viz., "the bloodless fold." We have called it the ileo-cæcal fold in accordance with Luschka's nomenclature. Tuffier and Waldeyer have called it the superior ileo-cæcal fold. Jonnesco refers to it as the "repli iléo-appendiculaire ou antérieur," and he calls the superior ileo-cæcal fossa the "fossette ileo-appendiculaire."

As regards the origin of the ileo-cæcal fold, our investigations incline us to think with Mr Treves that it was originally developed to carry blood-vessels to the cæcum and vermiform appendix, but that it has been replaced by the meso-appendix, which affords a shorter and more convenient route. Thus the ileo-cæcal fold would correspond to, and be the fellow of, the ileo-colic fold, which, it may be remembered, also carried vessels to the cæcum and appendix; one set passing over the ileum, the other under.

When we consider the great variations which occur in the folds and fossæ around the cæcum, it is easy to understand the great divergence of opinion which prevails as to their anatomy.¹

In the course of this communication we have mentioned four peritoneal folds—viz., (1) the ileo-colic fold, which bounds the ileo-colic fossa; (2) the ileo-cæcal fold, which deepens the ileo-cæcal fossa, and sometimes bounds the superior ileo-cæcal fossa; (3) the meso-appendix, which sometimes divides the ileo-cæcal fossa into two parts, viz., the superior and inferior ileo-cæcal fossæ; and (4) the plica vascularis.

The Subcæcal Fossa.—The subcæcal fossa is situated directly beneath the cæcum, which has to be lifted up to bring it into view. It is less often present than either the ileo-colic or the ileo-cæcal fossæ. Its anatomy is comparatively simple, and not, as a rule, complicated by any peritoneal folds, except, occasionally, the plica vascularis. Its mouth is usually at the junction of the cæcum and colon, or beneath either, and it separates the layers of the mesocæcum or mesocolon (fig. 5); its fundus runs upwards behind the ascending colon, between the layers of the ascending mesocolon. The length of the subcæcal fossa varies, but we have often seen it reach as far as the crest of the ilium, or beyond.

The subcæcal fossa lies close to the ileo-cæcal fossa, and is

¹ See also Alexander Macalister "On Two Dissimilar Forms of Perityphlic Pouches," *Proceedings of the Royal Irish Academy*, July 1875. A hernia of the appendix into the subcæcal fossa is given in this paper, and a number of references.

divided from it by the left side of the mesocæcum and ascending mesocolon (fig. 5). We doubt not but that these fossæ have often been mistaken for one another; but the subcæcal fossa, it is to be noted, is not in relation with either the ileum or its mesentery. In the case of the ileo-cæcal fossa being partitioned by the meso-appendix, then the latter fold would assist in distinguishing the inferior ileo-cæcal fossa from the subcæcal in as much as it would be the left boundary of the ileo-cæcal fossa, but have no share in forming the subcæcal.

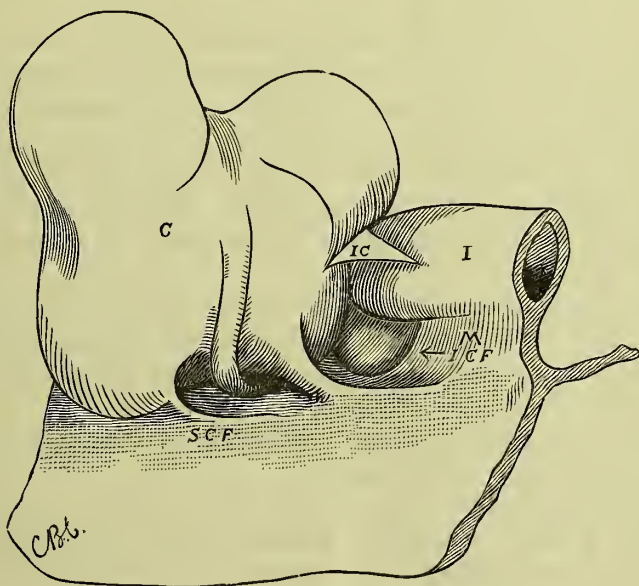


FIG. 5.—Subcæcal Fossa, shewing a hernia of vermiform appendix into it. C, cæcum; I, ileum; I.C., ileo-cæcal fold. I.C.F., ileo-cæcal fossa; the arrow points into the fossa. M, mesentery. S.C.F., subcæcal fossa.

As regards the origin of the subcæcal fossa, we have nothing to add to that which has been said already about the formation of the ileo-cæcal fossa. Like the latter, it originates during the progress of the cæcum and right colon into the iliac fossa, and it is during this event that the vermiform appendix may become herniated into it.

The subcæcal fossa has also been called the cæcal, and retro-cæcal.¹ There are some who think that it originates by a process of adhesion

¹ Jonnesco, *loc. cit.*, p. 125.

between the intestine and abdominal walls. It is said that there are sometimes two subcæcal fossæ, but we have not met with this condition.

The Positions of the Vermiform Appendix.

We now propose to describe the positions of the vermiform appendix, and at the same time refer to hernia of it into the subcæcal and ileo-cæcal fossæ. But, before doing so, it may be mentioned that the small intestines occasionally intrude themselves into those pouches.

Those who are interested in the subject will find in Jonnesco's work, to which we have repeatedly referred, a good account of cases in which the ileum has entered the superior ileo-cæcal fossa, the ileo-cæcal fossa, or the subcæcal fossa; and in some of these instances the intestine had been acutely strangulated. However, as we have met with no cases of this kind, we will proceed forthwith with the description of the position of the vermiform appendix.

The position and relations of the appendix were noted in 160 consecutive cases in which there was no manifest morbid condition of the abdominal cavity, such as peritonitis or local inflammation round the cæcum and appendix.

There were 104 male subjects and 56 female. The ages varied between 13 weeks and 81 years.

When free, that is to say, when held by nothing except the mesentery which we have just described, and when pervious, the appendix was considered to be normal.

The Normal Positions of the Vermiform Appendix.

1. In many cases the appendix is found lying under the inferior layer of the mesentery directed upwards and to the left in the direction of the spleen, a position which Mr Treves¹ considers to be its usual position.

2. Often the free appendix is found lying on the brim of the pelvis or projecting into the cavity of the pelvis, and in cases of peritonitis we have seen the appendix fixed to the right side of the pelvis, the broad ligament, or the bladder. When in

¹ *Hunterian Lectures*, Royal College of Surgeons, 1885, p. 43.

this position the appendix may, if diseased, be felt per rectum, and, as might be expected, inflammation of it has been known to cause bladder symptoms.

These two positions we have found to be the most usual for the vermiform appendix, and with a freely movable appendix it appears a matter of chance which of them is found. The appendix is easily displaced from one position to the other, so much so that we have hardly thought it possible to put it into correct statistical form.

3. With a long meso-appendix it may lie to the right of the cæcum and ascending colon, running upwards parallel to the colon, over the kidney and towards the right lobe of the liver.

4. The appendix may be found lying free over the cæcum and colon—we have recently noted this condition in a child of 5 months. This position is easily changed into that in which it lies parallel to the colon (v. 3 s.).

5. The appendix may lie perfectly free underneath the cæcum. Mr Treves¹ considers this as the commonest position for the vermiform appendix after (1); he found it in eighteen cases out of the hundred he examined. We have found it but rarely.

A pervious free vermiform appendix may, we consider, normally occupy any one of these five positions, though the first two are the most common.

In the 56 female subjects the normal condition was noted thirty times. In the 104 male cases it was found sixty-three times.

Appendix Free but Impervious.

In seven cases the vermiform appendix, though perfectly free and movable, was found to be impervious for its whole extent, this occurred four times in males, three times in females.

The appendix is frequently found partially impervious in old people, often for its distal third or half.

Occasionally cysts are found in connection with the appendix; thus in a woman aged 28 years the communication with the cæcum was closed, and the tube had colloid contents. Again, in a woman aged 70 years there was a calcareous mass encysted in the middle of the appendix, the lumen elsewhere being obliterated.

¹ *Loc. cit.*

ated. In a man aged 60 years there was a calcareous mass at the tip of the appendix, the rest of the lumen of the tube being obliterated. In all these the appendix was free, and there was no evidence of any inflammatory process.

Abnormal Positions, including Retro-peritoneal Hernia of the Appendix.

Under this heading we shall record all the instances of the appendix which we have noticed as (1) being fixed to the peritoneum lining the abdominal walls; (2) lodged in the retro-peritoneal fossa around the cæcum; (3) lodged in fossæ, the mouths of which have become closed. Instances of this latter class have, as we have already said, been described as congenital absence of the vermiform appendix.

Now, as any peritoneal inflammation around the appendix might fix it to the peritoneum, or so bind it down as at first to simulate a hernia of the appendix into one of the fossæ described above, care has been taken to look for any evidence of inflammation, and when any doubt existed the case has been discarded.

Abnormal positions of the vermiform appendix may be considered as being caused by—

1. Abnormal deficiency of the meso-appendix, as the result of which the appendix may lie (*a*) behind the peritoneum below the cæcum, viz., in the region of the subcæcal fossa; (*b*) fixed to the under surface of the cæcum and ascending colon; (*c*) behind the peritoneum in the region which the ileo-cæcal fossa would occupy if it was present; (*d*) fixed to the peritoneum along the outer or right border of the cæcum and ascending colon.
2. The existence of the retro-peritoneal fossæ described above, into the mouths of which the free appendix may pass, and thus constitute a retro-peritoneal hernia of the appendix cæci.
3. A combination of these two factors, the appendix, owing to a deficiency of its own mesentery, being fixed to the

peritoneum forming the floor of a developed ileo-cæcal (fig. 1) or subcæcal fossæ.

The abnormal positions of the vermiform appendix may be classified as follows :—

First. The vermiform appendix being fixed to the peritoneum in the region of the subcæcal fossa when that fossa is not developed. The appendix may be wholly or partially bound down to the peritoneum; for example, the proximal half or two-thirds may be fixed while the distal segment is free, either with a small meso-appendix or without.

The appendix was found in this position seven times. Six times in male subjects, once in a female subject.

This position of the appendix may be easily derived from the common normal position of the appendix on or over the brim of the pelvis by the withdrawal of its meso-appendix, due, as we have already described, to the peritoneal displacement by the gubernaculum.

Second. The appendix may be adherent to the under surface of the cæcum in contact with its muscular wall, and covered by its peritoneal investment. The end of a long appendix may pierce the peritoneum and pass upwards behind the ascending colon into the loose cellular tissue around the kidney. In such cases the tip of the appendix may lie over the kidney or in relation with the right lobe of the liver. Ulceration and suppuration of the appendix in this situation may easily simulate a lumbar or nephritic abscess, or even an empyema. In some cases the appendix was fastened to the cæcum in the way we have just described, with its tip projecting for half an inch into that part of the peritoneal cavity which lies behind and to outer side of the colon.

The appendix was noted as being tied down in the above way to the posterior surface of the cæcum in nine cases. Six times in male subjects, three times in female subjects.

Third. The appendix may be found in the subcæcal fossa either free or adherent to the peritoneum lining the fossa (*vide* fig. 5).¹

The appendix was found coiled up in the subcæcal fossa twelve times. Nine times in male subjects, three times in female subjects.

If suppuration occur in connection with the vermiform appendix when lying in the subcæcal pouch, the mouth of the pouch is soon closed, and a local abscess instead of general peritonitis will result. We have seen such an abscess travel down the sheath of the psoas and present in the groin, or discharge itself into the cæcum.

Fourth. The appendix may be fixed to the peritoneum along the right border of the cæcum and ascending colon; the tip is often quite free and stands up like a crook, unprovided with a meso-appendix. This condition is easily derived from one of the normal positions of the appendix by the subtraction of its meso-appendix.

This condition was noted five times. Three times in male, twice in female subjects.

Fifth. The appendix may be fixed behind the peritoneum in the region of the ileo-cæcal fossa, that fossa not being developed (*vide* fig. 1). When long, the appendix may be adherent to and covered by the inferior layer of the mesentery. The tip of the appendix, as in the preceding positions, may be free either with or without a meso-appendix. This position is easily derived from the common normal position of the appendix by the subtraction of its meso-appendix.

This condition was found twelve times. Eight times in males, four times in females.

Sixth. The appendix may be found in the ileo-cæcal fossa (*vide* fig. 2), where it may be free, or from deficiency of

¹ For examples, *vide* Dunn, *Path. Trans.*, 1889, p. 114; Lockwood, *Hunterian Lectures*, 1889, p. 81.

the meso-appendix, may be adherent to the peritoneum forming its floor.

This variety of hernia was found nine times; five times in male subjects, and four times in female subjects.

Ulceration of the appendix within the ileo-cæcal fossa leads to a local abscess. We have seen such an abscess travel round the pelvis behind the rectum and form a swelling near the left broad ligament, which was thought by some to be a parametric abscess.

Seventh. The appendix may lie completely hidden in either the subcæcal or ileo-cæcal fossa, the mouth being closed. In cases such as these the vermiform appendix may require careful searching for, and, indeed, may be thought to be absent at first. Owing to the fact that the mouth of the fossa has been closed, it may be impossible to say whether the closed fossa was originally subcæcal or ileo-cæcal.

This condition was found twice, both times in male subjects.

Summary.

Appendix Vermiformis:—

Normal—

<i>Free, pervious,</i>	.	.	.	.	.	94	
<i>Free, obliterated,</i>	.	.	.	.	.	7	
<i>Free, with cysts,</i>	.	.	.	.	.	3	
							104

Abnormal—

1. Adherent to peritoneum in the sub-cæcal region,	.	.	.	.	.	7	
2. Adherent to the under surface of the cæcum,	.	.	.	.	.	9	
3. In the subcæcal fossa,	.	.	.	.	.	12	
4. Fixed to the right of the cæcum,	.	.	.	.	.	5	
Carry forward,	.	.	.	.	.	33	104

Summary—continued.

<i>Abnormal</i> —	Brought forward,	33	104
5. Adherent to the peritoneum in the region where the ileo-cæcal fossa develops,		12	
6. In the ileo-cæcal fossa,		9	
7. Hidden in fossa, the mouth of which had closed,		2	
		—	56
			—
			160

The drawings which illustrate this communication have been made by Mr Lockwood from specimens which are in the St George's Hospital Museum.